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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/528,583	08/19/2005	Alan John Hopper	056258-5098	7148

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MORGAN LEWIS & BOCKIUS LLP  
1111 PENNSYLVANIA AVENUE NW  
WASHINGTON, DC 20004

EXAMINER
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TADAYYON ESLAMI, TABASSOM

ART UNIT	PAPER NUMBER
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1792

MAIL DATE	DELIVERY MODE
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08/19/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/528,583	<b>Applicant(s)</b> HOPPER ET AL.	
	<b>Examiner</b> TABASSOM TADAYYON ESLAMI	<b>Art Unit</b> 1792	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 April 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11, 15, 16, 18 and 24-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, 15, 16, 18 and 24-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>04/24/09</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. ***Claims 1-2, 5, 11, 15, 18, 24-25, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce A. Lent et al (U. S. Patent: 5270368, here after Lent), further in view of Michael Chen et al (U. S. Patent Application: 2003/203994, here after Chen).***

3. Claims 1, 5, 11, 15, 24, and 28 are rejected. Lent teaches a method for making an electronic device such as printed circuit board[abstract]comprising, applying a mask to a dielectric substrate (ceramic) by ink jet printer inherently to selected area of the substrate[ column 3 lines 22-25]. Lent teaches exposing the mask ink to actinic radiation (UV) [abstract]. Lent also teaches the mask is for using in printing circuit board and for applying metal layer (copper plating) onto it [column 1 lines 40-55]. Lent also discloses that the mask can be applied to a substrate by ink jet painter under control of a computer [column 2 lines 37-39]. Lent further teaches the mask ink comprises, Acrylate functional monomer (acrylated epoxy monomer), adhesion promoting organic compound, initiator (photo initiator), surfactant, and pigment [column 3 lines 37-52]. Lent also teaches the composition further comprising a colorant [column 7 lines 38-41].

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Lent teaches the amount of acrylate functional monomers is from 5-95% [column 8 example 1], amount of metal adhesion promoting organic compound is 2-10% [column 7 lines 39-43], the amount of initiator is 2-10% [column 6 lines 9-11], and amount of colorant in range about 0.5-4% [column 7 lines 41-43], where the percentages is based on weight percent. Although Lent does not clearly teach the mask is a solder mask or for applying solder to the substrate, however it is obvious that the mask is capable to be employed as solder mask, because Lent teaches the mask is suitable to apply metal layers on it. The composition taught by Lent also is free of organic solvents and is a non aqueous composition (not include water) [example 1]. Lent does not teach the composition comprising polymer. Chen teaches a method for making an electronic device such as printed circuit board [0001] comprising, applying a non-aqueous solder mask ink to a substrate containing electrically conductive metal circuitry( circuit board), exposing the mask ink to actinic radiation (UV) [0006 lines 16-18]. Chen further teaches the mask ink comprises, Acrylate functional monomer [0018 lines 1-9], adhesion promoting organic compound (binder) [0016], initiator (photo initiator) [0014], polymer [0011, 0018], and pigment [0020]. Although Chen does not clearly teaches using surfactant in the composition, however Chen teaches using defoaming which inherently changes the surface tension of the composition [0015]. Chen further teaches the composition is solvent free [title]. Chen does not specifically teaches the amount of each ingredient, however, according to *MPEP Ch.2144.05 II A*, "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454,

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456,105 USPQ 233, 235 (CCPA1995). It would have been obvious to include the claimed ranges as such are well within the level of the ordinary skill in the art, absent a showing of criticality. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the amount of each ingredient in solder mask is based on claim 1, because the optimum or workable ranges obtain by routine experimentation.

Claim 2 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above. Lent further teaches the viscosity of the composition is 1-10 cpoise at 25 degree C [column 7 lines 63-64]. Although Lent does not teach how much the viscosity in 40 degree C is, however it is inherent that the viscosity decreases with temperature and also it is obvious that the viscosity of the ink has to be appropriate so the ink can be ejected from the ink jet printer as the viscosity of the ink is result effective variable [MPEP 2144.05.II.B]. If the ink is very viscous, the ink can not drop from the nozzle and if it the viscosity of the ink is very low, then the ink will not stay on the surface at specific places (to make a pattern) and run everywhere on the surface. Therefore, it would have been obvious to optimize the viscosity of the ink. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have a method of making an electronic device as Lent and Chenteach, where the viscosity of eh ink is 8-20 cps(optimized), because the viscosity of eth ink is result effective and has to be optimized.

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Claim 18 is rejected. Lent teaches the amount of initiator is up to %10[column 6 lines 9-10].

Claim 25 is rejected for the same reason claims 1 and 2 are rejected.

**1. Claims 4, 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce A. Lent et al (U. S. Patent: 5270368, here after Lent), and Michael Chen et al (U. S. Patent Application: 2003/203994, here after Chen), As applied to claim 1 above, further in view of Songvit Setthachayanon (U. S. Patent: 5089376, here after 376).**

Claim 4 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above. They do not teach the monomer is and trimethylolpropane ethoxylate tiacrylate. 376 teaches a solder mask comprising a UV sensitive coating composition [abstract] comprising a functional monomer (cross linker) [column 3 lines 25-28, lines 48-49] photoinitiator, pigment (colorant), and adhesive promoting (binder) composition [column 3 lines 4-17]. 376 teaches the acrylated functional monomer is trimethylolpropane ethoxylate tiacrylate[ column 9 lines 46-47]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the resist mask comprising an adhesive promoting agent and also a copolymer binder as 376 teaches, and the acrylated functional monomer is trimethylolpropane ethoxylate tiacrylate, because 379 teaches it is suitable to have is trimethylolpropane ethoxylate tiacrylate as acrylated monomer in solder mask composition.

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Claim 6 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above. They do not teach the binder (adhesion promoting organic compound) is an acrylate functional monomer. 376 teaches a solder mask comprising a UV sensitive coating composition [abstract] comprising a functional monomer (cross linker) [column 3 lines 25-28, lines 48-49] photoinitiator, pigment (colorant), and adhesive promoting (binder) composition [column 3 lines 4-17]. 376 teaches the composition comprising a copolymer as a binder (or adhesion promoting agent) [column 3 lines 46-49]. 376 teaches a cross linker also helps the solder mask to improves adherence to metals [column 3 lines 39-45], and further teaches the cross linker is (meth) acrylate monomers [column 3 lines 48-49]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the adhesion promoting agent (metal adhesion promoting organic compound) comprising acrylate functional monomers as 376 teaches, because 376 teaches combination of binder, a crosslinker and a carboxylated urethane di (and/or) tri (meth) acrylate improves the resist to adhere to metal.

Claim 7 is rejected for the same reason claim 6 is rejected. 376 teaches carboxylated urethane di and/or tri (meth) acrylates are prepared from carboxylic acid [column 2 lines 43-61] which is inherently a metal chelant group. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the adhesion promoting agent (metal adhesion promoting organic compound) comprising

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chelant group as 376 teaches, because 376 teaches it is suitable to have chelant group as adhesion promoting agent.

Claim 8 is rejected for the same reason claim 6 is rejected. 376 also teaches the binder is methylmethacrylate-methylacrylate methacrylic acid [column 9 lines 24-26]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the adhesion promoting agent (metal adhesion promoting organic compound) comprising methylmethacrylate-methylacrylate methacrylic acid as 376 teaches, because 376 teaches it is suitable to have methylmethacrylate-methylacrylate methacrylic acid as adhesion promoting agent.

**2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce A. Lent et al (U. S. Patent: 5270368, here after Lent), Michael Chen et al (U. S. Patent Application: 2003/203994, here after Chen), as applied to claim 1 above, further in view of Isao Sasaki et al ( U. S. Patent: 4789620, here after Sasaki).**

Claim 3 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above, they do not teach the molecular weight of the acrylate functional monomer is not greater than 2000. Sasaki teaches a solder mask usable for making printed circuit boards[abstract last 6 lines, column 1 lines 13-17], containing acrylated functional monomer, where the monomer has average molecular weight of less than 2000[column 2 lines 45-57]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the molecular weight of the monomer is less than 2000 as



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Sasaki teaches, because Sasaki teaches the molecular weight appropriate for monomers is 200-800 for making solder mask composition.

***Claims 9-10, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce A. Lent et al (U. S. Patent: 5270368, here after Lent), and Michael Chen et al (U. S. Patent Application: 2003/203994, here after Chen), further in view of Yasufumi Sato et al (U. S. Patent: 4839400, here after Sato).***

Claim 9 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above, they do not teach the composition comprising polypropylene glycol tetra acrylate containing meth(acrylate) acid as adhesion promoter. Sato teaches a curable resin[abstract lines 1-2] usable to make solder mask for making printed wiring boards[ column 8 lines 46-56], where the monomers of meth(acrylic) acid such as polyethyleneglycol mono (meth) acrylate is in the composition[column 6 lines 54-57] to increase the adhesion. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where the composition comprising polyethyleneglycol tetra (meth) acrylate containing meth(acrylic) acid as Sato teaches the composition comprising polyethyleneglycol mono (meth) acrylate is suitable to form a resin for solder mask.

Claim 10 is rejected. Lent, Chen and Sato teach the limitation of claim 9 as discussed above and 376 teaches the acid value of the adhesion promoter is less than 120 mg KOH/g[column 9 lines 18-20].

Claim 26 is rejected for the same reason claim 25, 10, and 7 are rejected.

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**3. Claims 16, 27 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruce A. Lent et al (U. S. Patent: 5270368, here after Lent), Michael Chen et al (U. S. Patent Application: 2003/203994, here after Chen), as applied to claim 1 above, further in view of Toshihiro Motoshima et al (U. S. Patent: 5677398, here after 398).**

Claim 16 is rejected. Lent and Chen teach the limitation of claim 1 as discussed above. They do not teach the ink has an acid value of less than 30 mg KOH/g. 398 teaches a curable resin composition[abstract last 5 lines] usable as solder resist(mask) and printing ink[column 1 lines 6-12], where the acid value of the resist is 20[column 6 lines 6-7]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of making an electronic device as Lent and Chen teach where acid value of the resist (ink) is less than 30(20) mg KOH/ g, as 398 teaches, because 398 teaches it is suitable acid value for curable ink usable as solder resist mask.

Claim 27 is rejected for the same reason claims 25 and 16 are rejected.

Claim 28 is rejected for the same reason claim 1 and 26 is rejected.

Claim 29 is rejected. Lent, Chen and 398 teach the limitation of claim 27 as discussed above and it is inherent that the ink jet printer using by Lent has a cartridge having a chamber where the ink (solder mask ink) is inside the chamber, As Lent teaches the ink is applied by ink jet printing method [ abstract lines 1-5].

***Response to Arguments***

The examiner admitted the listed claims 9, 10, 24, and 26 on PTO-326 mistakenly marked as "objected to" and there is not objection to the said claims.

4. Applicant's arguments, see Remarks, filed 04/24/09, with respect to the rejection(s) of claim(s) under 35 U.S.C 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Chen et al.

5. The applicant argues none of the references teach the ink comprises less than 2 parts of organic solvent. The examiner disagrees; Chen teaches a solventless ink and is substantially free of organic solvents.

6. The applicant further argues Lent does not teach or suggest solder mask ink and instead clearly teaches etch resist inks, and Lent and 376 patent relates to very different application method. The examiner disagrees; the mask taught by Lent is a mask for etching however it is capable to use in solder deposition as well. Furthermore if the composition of the ink is taught by Lent and 376, the ink inherently has the hardness and heat resistance property requires for solder mask.

The applicant argues 376 teaches the composition comprising low viscosity embodiments and a solvent should be added to it. The examiner disagrees; Chen and Lent teaches all limitation of claim 1 except of that the ink comprising polymer (binder) and 376 teaches adding binder (polymer) to a solder mask composition.

The applicant argues Lent relates to low viscosity ink and 376 patent relates to a high viscosity ink and can not be combine together, however as discussed above the

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ink composition is based on Chen and Lent's teaching and only the binder (polymer) of the compositing is based on 376 teaching, furthermore it is well known in the art even if adding small amount of binder changes the viscosity of the composition, how to lower the viscosity of the ink in order to use ink jet printer for applying the ink.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TABASSOM TADAYYON ESLAMI whose telephone number is (571)270-1885. The examiner can normally be reached on 7:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tabassom T. Tadayyon-Eslami  
Examiner  
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/Tabassom T. Tadayyon-Eslami/  
Examiner, Art Unit 1792  
/Michael Cleveland/

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